Windows® XP Gold eBook

Pedro Filipe C. Jesus
April / 2009

INDEX

INTRODUCTION

Though Windows XP is Microsoft's most popular desktop operating system, it is not without its challenges. Like with any OS or application, troubleshooting Windows XP can be frustrating for Windows administrators. Fortunately, with the right tips any admin can troubleshoot Windows XP desktop issues with relative ease, and our Windows XP Troubleshooting Tutorial is designed to help IT pros do just that. This tutorial provides troubleshooting tips that every admin should know, with advice on troubleshooting Windows XP startup problems and the dreaded Blue Screen of Death (BSoD). You'll also find info on how to troubleshoot features such as Windows XP System Restore and Device Manager, network and printer problems and more interesting stuff.

This troubleshooting guide was made with the objective to join in one document a collection of several “Favorites” websites that I had in my computer.

Requirements:
You need a computer with internet access.

HOW TO TROUBLESHOOT WINDOWS XP STARTUP PROBLEMS

One of the most common troubleshooting problems in Microsoft Windows XP involves the failure of a system to start up properly. These failures can be caused by a number of issues, including poorly written or malicious software, faulty device drivers, hardware incompatibilities, corrupt or missing system files and incorrect system configurations. Determining the source of the problem -- and fixing it -- is easier if you use a methodical, step-by-step approach.

Where to Start

The first question that should be asked when troubleshooting Windows XP startup problems is: What changed? If a user has just loaded new software, added new hardware, updated drivers or made a change to the Windows XP system configuration, you should assume this was the cause of the issue until you have ruled it out by undoing the change. This includes operating system updates from Microsoft, which have been known to cause an occasional issue. If a recent change is not a potential cause of the Windows XP startup failure, you should suspect hardware failure, viruses or malicious software or data corruption. Troubleshooting the issue will depend on the point at which startup fails. The further along in the startup process the failure occurs, the easier it is to troubleshoot and repair.

If the workstation starts normally and fails after logon, then the problem may be related to a user profile, network logon script, application, driver or service. If Windows XP produces an error message or blue screen, copy the message and check Microsoft's Knowledge Base to see if it is a known issue and if a workaround or patch exists. If the issue is not in Microsoft's database, try searching technical discussion groups, third-party sites or Usenet.

If you do not receive an error message, and the system simply hangs or continually restarts, there are several troubleshooting techniques you can try. For example, you can try logging in with a different account, or a local account. You can also perform a clean boot or try booting into Safe Mode.

When troubleshooting Windows XP, if the system will not start in Normal Mode or Safe Mode -- it's usually not a good sign. This may be the result of corrupt or missing system files, a corrupt registry, hardware drivers or failed services. Your first step is to press F8 during Windows XP Startup and select the Last Known Good Configuration option from the Windows Advanced Options Menu. If Windows XP boots normally, check the event logs and hardware manager for clues as to what may have caused the failure. You may also want to check the Add/Remove Programs menu for any new applications that may have contributed to the failure.

The Last Known Good Configuration and Chkdsk

If the Last Known Good Configuration fails, the next step is to start the Windows XP Recovery Console. The Windows XP Recovery Console is a command line utility that can be used to troubleshoot a number of issues in the event that Windows XP cannot start, including starting and stopping services and drivers. You can start the Recovery Console by booting from the Windows XP Startup CD and pressing "R" to repair when the "Welcome to System Setup" screen appears, then press "C" to start the Recovery Console. If you receive an error on startup stating that a system file is missing or corrupt, Recovery Console can be used to replace those files as well.

If you are unable to determine if a driver or service is responsible for the Windows XP startup failure, you should run the Windows XP Checkdisk utility from the Recovery Console by typing CHKDSK at the command prompt. This utility scans your hard drive and checks for problems with the disk or file system, which may result in corrupt or missing system files.

These Windows XP troubleshooting techniques should usually help you figure out the source of the startup problems. However, if you are still unable to determine the cause of startup failure at this point, you do have a few options left.

If your Windows XP machine won't boot at all, you can try using your emergency Windows XP boot floppy. If your hard drive's boot sector or Windows' basic boot files have been corrupted, this disk will circumvent the problem and boot you into Windows XP. If you don't have an emergency boot floppy, you may be able to use one created on another PC running Windows XP, but there's no guarantee that it will boot your machine.

TROUBLESHOOTING WINDOWS XP SLOW STARTUP ISSUES

One way to troubleshoot Windows XP when the system is slow to startup is by disabling annoying and unnecessary Windows XP startup programs. By far the easiest way to temporarily disable startup programs is to boot the system into Safe Mode, as Safe Mode boots Windows XP using a bare configuration. It loads only the essential device drivers, and Windows does not load any startup programs. That way, if a particular device driver or startup program is causing problems, you can boot Windows XP without loading it. You are then free to disable or remove the driver, service or application that is causing the problem.

You can access Safe Mode by pressing the F8 key just before Windows XP begins to boot (you may have to press F8 repeatedly). Upon doing so, the Windows boot menu will be displayed, which gives you several different boot modes to choose from, such as Safe Mode with Networking, Safe Mode with Command Prompt and Directory Services Restore Mode. Below is a brief explanation of each of these modes:

- **Safe Mode** - Safe Mode boots Windows using a minimal driver set and without loading any startup applications.
- **Safe Mode with Networking** - This option does the same thing as Safe Mode, except that it also loads the drivers and services necessary for network access.
- **Safe Mode with Command Prompt** - This option is similar to Safe Mode, except that the system boots to a command prompt rather than to a GUI. This option is most useful for repairing GUI-related problems.
- **Enable Boot Logging** - If you select this option, Windows will create a diagnostic log of the boot process. You can use this log to figure out where the process is breaking down. The log file is named NTBLOG.TXT and is located in the %SYSTEMROOT% folder. You can use boot logging in conjunction with any of the safe mode boot options except for the Last Known Good Configuration option.
- **Enable VGA Mode** - The Enable VGA Mode option is intended for use when the correct video driver is installed, but Windows was accidentally configured to use an incompatible display resolution. The Enable VGA Mode option boots Windows using the current video driver but uses a 640 x 480 resolution. This gives you the opportunity to reset the display resolution. Safe Mode and Safe Mode with Networking also use a decreased screen resolution but do so by using the VGA.SYS driver rather than the video driver that was specifically designed for your video card. Therefore, the Enable VGA Mode is the option of choice for resetting the display resolution.

- **Last Known Good Configuration** - When Windows boots successfully, it makes note that it was able to boot successfully by marking the configuration as "good." If you make a configuration change that renders Windows unbootable, you can select the Last Known Good Configuration option to boot Windows using a known good configuration.
- **Directory Services Restore Mode** - Although this option appears on Windows XP's menu, it is only valid for Windows Server machines that are acting as domain controllers.
- **Debugging Mode** - This option is an obsolete leftover from Windows NT. The option allows you to send debugging information over a serial port (COM2) to another computer that is running a debugger. However, modern computers are no longer equipped with traditional serial ports.
- **Disable Automatic Restart on System Failures** - This option prevents Windows from automatically rebooting when a blue screen error occurs. It is useful for troubleshooting when a machine mysteriously reboots itself in the middle of the night.
- **Start Windows Normally** - This option causes Windows to load in the normal way.
- **Reboot** - Use this option to reboot the machine.
- **Return to OS Choice Menu** - Selecting this option takes you to a screen that lets you choose which of the installed operating systems you want to boot. Unless you are running a dual boot or a multi-boot configuration, Windows XP will be the only choice.

Using the Shift key

You can also prevent some Windows XP startup programs from running by simply using the Shift key. When you boot Windows XP, enter your username and password and click OK. Immediately after that, hold down on the Shift key until all of your desktop icons appear. However, be aware that this troubleshooting trick will not give you quite as clean of a boot as booting to Safe Mode, and all of the usual device drivers will be loaded. Holding the Shift key down only prevents Windows XP applications from launching automatically from the following locations:

```
\Documents and Settings\Username\Start Menu\Programs\Startup
\Documents and Settings\All Users\Start Menu\Programs\Startup
Windir\Profiles\Username\Start Menu\Programs\Startup
Windir\Profiles\All Users\Start Menu\Programs\Startup
```

One important thing to keep in mind about this technique is that applications may still launch from other locations. For example, it is common for applications to be launched by instructions embedded in the system's registry. If an application is called from the registry, it will still load, regardless of whether the Shift key was held down or not.

Editing the registry in Windows XP

The Windows registry can be configured to launch applications at startup. In fact, adding calls to launch applications to the Windows registry is a favorite technique of malware authors. Don't assume though that just because a process is being launched from a call in the registry that the process is related to malware, because many legitimate applications are launched through the registry. This is particularly true of antivirus software and other applications that run in the background.
The most effective way to prevent an application from running on startup is to simply delete the registry key that calls it. Before you do, though, it is extremely important that you know exactly what it is that you are deleting. I will talk about identifying unknown processes in much more detail later in this series. For now, however, if you need to identify a process prior to deleting a registry key that calls it, try doing a Google search on the process' file name.

WARNING: Editing the registry is dangerous. Making an incorrect modification to the registry can destroy Windows and/or your applications. I therefore recommend making a full system backup before continuing.

With that said, Windows differentiates between processes that are only run during the next reboot and those that are configured to run every time Windows is started. Calls to processes that are run only after the next reboot can be found beneath the following registry locations:

```
HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\RunOnce
HKEY_Current_User\SOFTWARE\Microsoft\Windows\CurrentVersion\RunOnce
```

Finding calls to processes that run each time Windows is booted is a bit trickier. Here are the primary locations where these calls are stored:

```
HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\Run
HKEY_Current_User\SOFTWARE\Microsoft\Windows\CurrentVersion\Run
```

Calls can also be made on a per-user basis. The problem is that users are identified by GUID, rather than by user name. It is common for some types of malware to create a call to a malicious process for each individual user. The idea is that if one user cleans the call to the process from the machine, another user can log into the machine and cause it to become infected all over again. This is because Windows processes a registry key that is not processed when other users log in. Therefore, if you are trying to track down a malicious process, then it is a good idea to check each user account.

Typically, there won't be too many accounts to sift through, and you can find calls to startup programs for individual user accounts at the following location:

```
HKEY_Users\user's GUID\SOFTWARE\Microsoft\Windows\CurrentVersion\Run
```

For users working in large networks, Group Policy can be used to prevent the registry from launching applications on system startup in Windows XP. Keep in mind though that using Group Policy settings as a troubleshooting technique here is usually an all or nothing proposition, as the Group Policy Object Editor isn't flexible enough to allow users to selectively enable and disable various processes. You have the option of preventing Windows XP from using the registry to launch processes at startup, but, by doing so, you may disable desirable processes as well as unwanted ones. You do, however, have the option of specifying the processes you want to run when a user logs in directly through the Group Policy rather than through the registry.
Since Group Policies are hierarchical in nature, in the beginning I recommend that you experiment with this technique using only the local security policy on a few workstations. If testing reveals that this technique isn't going to cause problems, then you can always implement the settings at the domain or OU level of the Group Policy hierarchy later on.
To prevent processes from being called from the registry at system startup, open the Group Policy Object Editor and navigate through the Group Policy tree to the following location:
User *Configuration**Administrative Templates**System**Logon*

There are three Group Policy settings of interest in this location:

Do Not Process the Run Once List - This setting prevents processes listed in the following registry locations from being launched:

```
HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\RunOnce
HKEY_Current_User\SOFTWARE\Microsoft\Windows\CurrentVersion\RunOnce
```

Do Not Process the Legacy Run List - This setting prevents processes listed in the following registry locations from being launched:

```
HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\Run
HKEY_Current_User\SOFTWARE\Microsoft\Windows\CurrentVersion\Run
KEY_Users\user's GUID\SOFTWARE\Microsoft\Windows\CurrentVersion\Run
```

Run These Programs at User Logon - This setting allows you to specify the process that you do want to run during startup.

Calls to startup processes can be associated either with the computer or with the user account. Therefore, you will find a duplicate set of Group Policy settings beneath the Group Policy Editor's Computer Configuration container at Computer Configuration\Administrative Templates\Logon.

The Windows XP System Configuration Utility

Other ways to disable Windows XP startup programs include making changes to the Startup folder and WIN.INI file. For example, any application placed in the Startup folder will load automatically when Windows XP is booted. Although you can edit the Startup folder and the WIN.INI file manually, it's sometimes easier to use the System Configuration Utility when troubleshooting Windows XP instead, because it allows you to enable or disable commands by simply selecting or deselecting check boxes. This is handy since sometimes you might see an entry for a startup program that you don't recognize.

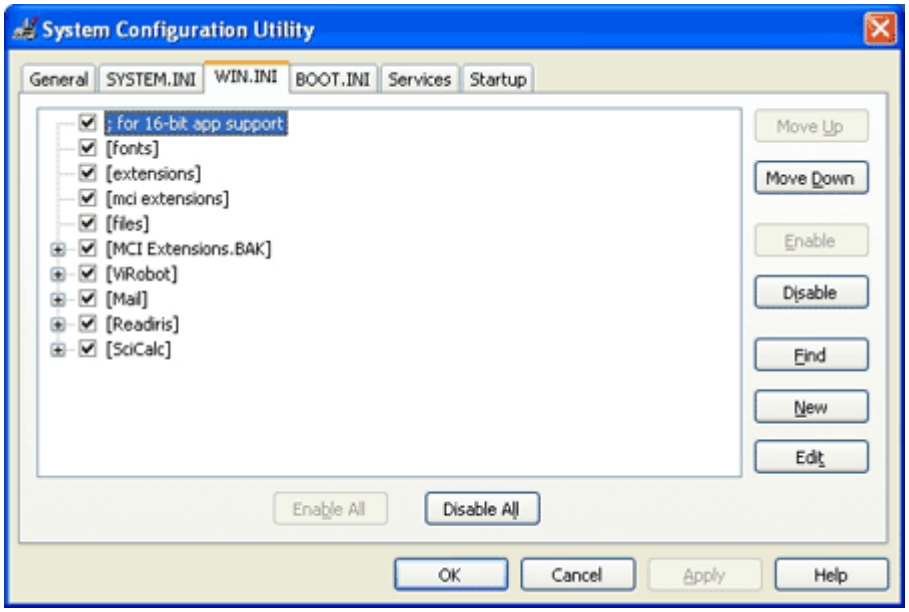
The System Configuration Utility allows you to temporarily disable such an entry - and learn the effects of doing so - without making a permanent configuration change to your system. Once you are confident in the changes that you have made, you can then make them permanent. You can access the System Configuration Utility by entering the MSCONFIG command at the Run prompt.

Another place where Windows can load programs during startup is the WIN.INI file. The WIN.INI file is left over from the days of Windows 3.x and has been retained for backward compatibility purposes.
WIN.INI is a text file located in the \Windows folder that can be opened using Notepad. There are two lines in the WIN.INI file that are of particular interest to admins. These lines are:

```
LOAD=
RUN=
```

By default these particular lines of code do not even exist in Windows XP, while older versions of Windows included these lines near the top of the WIN.INI file. The idea was that third-party application developers could use them as a way of automatically loading applications or application modules at system startup.
Microsoft chose to remove the Load= and Run= lines from Windows XP because it prefers application developers to use the registry as the primary means for launching code during startup. Even so, these commands are still fully supported and are often added to the WIN.INI file by malware authors. Over the past several years, I've seen numerous cases in which various types of spyware have been launched through the WIN.INI file because relatively few people know that WIN.INI can be used to launch startup programs.

Although you can edit the Startup folder and the WIN.INI file manually, it's sometimes easier to use the System Configuration Utility instead. Personally, I prefer using the System Configuration Utility initially because it allows you to enable or disable commands by simply selecting or deselecting check boxes. This is handy since sometimes you might see an entry for a startup program that you don't recognize. The System Configuration Utility allows you to temporarily disable such an entry - and learn the effects of doing so - without making a permanent configuration change to your system. Once you are confident in the changes that you have made, you can then make them permanent.
Also, any time you've made a change to the system startup by using the System Configuration Utility, you will see a warning message during the boot process. To get rid of this warning message, you must perform a normal startup and then manually remove the offending settings.



TROUBLESHOOTING THE BLUE SCREEN OF DEATH (BSoD)

When Windows XP encounter a serious system problem, the result is what has become known as the Blue Screen of Death, which is an error displayed in a full-screen, non-windowed text mode, with white text on a blue background providing information about why Windows XP crashed.
The first step in troubleshooting the Windows XP Blue Screen of Death is figuring out what is causing the error to occur. Whenever a Blue Screen of Death error is displayed, the error contains a Stop message - a short error message meant to give you a clue as to the cause of the problem. When troubleshooting Windows XP, it's important to know that the Stop message is broken into four different parts, each of which has its own purpose. These parts include Bug Check Information, Recommended User Action, Driver Information and Debug Port and Status Information.

How to troubleshoot a Windows XP Stop message

The Bug Check Information is made up of a stop error number immediately followed by four additional parameters that are listed in parenthesis. From a Windows administrator's standpoint, the four numbers found in parenthesis are almost always unimportant, as knowing the stop error code is typically sufficient.

The second part of the Stop message in Windows XP is the Recommended User Action, which is usually a generic message telling you to try disabling or removing whatever hardware or software was recently installed. While this is good advice, it won't always fix the problem. By far the most important part of the Recommended User Action is the very first line. This line directly corresponds to the stop error number. Using this bit of text in conjunction with the stop error number can give admins a lot of insight into what the problem is.

The Driver Information section tells you which file triggered the stop error. By looking at the driver listed in this section and the information provided in the Bug Check Information and Recommended User Action sections, you can usually gain a fairly clear picture of what has happened.
The Debug Port and Dump Status Information section tells you few things. First, it tells you is which COM port is being used by the debugger and what speed the COM port is running at (information that can be ignored with Windows XP). The other thing that this section tells you is that a dump file was created. Essentially this means that the entire contents of the system's memory were written to a file and placed on the hard drive. Some Windows administrators like to use this file as a tool for troubleshooting the problem, though it is usually possible to fix the problem without delving into that level of complexity.

Different types of Stop messages

There are *five different Stop messages* that are commonly displayed when a Windows XP Blue Screen of Death error is disk-related.

Stop: 0x0000007B or INACCESSIBLE_BOOT_DEVICE

This error message only occurs when Windows is booting. Two conditions can trigger this error:

- Windows was unable to initialize the disk hardware.
- Windows initializes the disk hardware, but does not recognize the data found on the system volume.

Whenever I've seen this error, it was caused by corrupted or incorrect device drivers for the disk controller. (This is particularly common when the system is booting from a SCSI drive or a RAID array.) However, this error can also result from file system corruption, a boot sector virus or disk-related hardware problems. It can even occur on new systems in which the disk controller contained outdated firmware.

Stop: 0x00000050 or PAGE_FAULT_IN_NONPAGED_AREA

Actually, this particular Stop error is not always disk-related. More often than not it's related to faulty memory. The error indicates that the system tried to read data from the system memory, but that the requested data was not found.

When the above error is disk-related, it can usually be traced to either a corrupted disk volume or faulty disk cache memory.

Stop: 0x00000024 NTFS_FILE_SYSTEM

In newer versions of Windows, this error message almost always points to either corrupted system files on an NTFS volume or to bad blocks on the hard drive. In either case, I recommend running the chkdsk tool with the /F switch to correct the error. Although chkdsk can repair many types of disk errors, you may end up having to reinstall the latest Windows service pack (or reinstall Windows if no service packs exist yet) so that system files are overwritten with clean versions.

Older versions of Windows produced this error message for other reasons. The AppleTalk driver was known to trigger the error if too many files were present on a shared volume. The error might also be attributed to the use of an incompatible antivirus program or disk utility.

0x00000077 or KERNEL_STACK_INPAGE_ERROR

This is another error message that can point to several causes. The error itself indicates that the system attempted to read data from the pagefile, but was unable to locate the requested page. The cause is often a memory error or else a storage hardware problem, such as a loose data ribbon, incorrect SCSI termination or bad sectors on the hard disk.

The problem can also occur if another system component has a resource conflict with the disk controller, or if a virus is present.

Stop: 0x0000007A or KERNEL_DATA_INPAGE_ERROR
Although this error refers to the actual pagefile data rather than the stack, the actual causes of the error are identical to those of a KERNEL_STACK_INPAGE_ERROR. The only real difference is that, in rare cases, this error can occur if the system runs low on non-paged pool resources.

You can troubleshoot this Blue Screen of Death error by trying the Last Known Good Configuration utility. If that doesn't work, the next step would be to boot your Windows XP recovery CD to repair the problem in Recovery Console Mode. Typing chkdsk drive: /F /R at the command prompt windows should fix the error.
In most cases, stop errors will occur immediately after installing a piece of hardware or software, or changing some aspect of Windows XP's configuration. If you notice this type of cause and effect pattern, then a good Windows XP troubleshooting best practice would be to boot Windows XP into Safe Mode and then troubleshoot whatever action it was that caused the problem (or remove the new hardware).

If the problem just starts happening for no apparent reason, then there are two things that you should look for; file corruption and memory problems. Try reinstalling the latest Windows XP service pack (to refresh the system files) and download the latest versions of all of the device drivers that are used by the system. If that doesn't work, then try removing the computer's memory and replacing it with known good memory. Nine times out of ten this will fix the problem.

Windows XP Events and Errors Database
The Windows XP Events and Errors search page provides an easy-to-search, online reference for the error and event messages generated by Windows XP Professional. Find detailed explanations, recommended user actions, and links to additional support and resources.

Webcast: Basic "Blue Screen" Error Troubleshooting
Microsoft Knowledge Base Article: 325011 - In this session, we will cover the basics of "blue screen" errors, what they mean, and some common methods to troubleshoot the problems. We will provide some background information about blue screen errors, and we will talk about how to interpret the information, as well as how to recover from these errors.

Windows XP Error Codes

Stop: 0xA0 - Error Message during Hibernation
Microsoft Knowledge Base Article: 320899 - When you try to hibernate Windows XP

Stop: 0xC2 or
Stop: 0x000000C2 Error
Microsoft Knowledge Base Article: 314492 - This article explains how to debug Stop C2 errors.

Stop: 0x000000EA - Error Message When You Run Video-Intensive Programs
Microsoft Knowledge Base Article: 314215

Stop: 0x000000ED UNMOUNTABLE_BOOT_VOLUME
Microsoft Knowledge Base Article: 297185 - When you first restart your computer during the upgrade to Windows XP.

Stop: 0x000000ED Error Message When Volume on IDE Drive with Caching Enabled Is Mounted
Microsoft Knowledge Base Article: 315403 - When you use volumes that use the NTFS file system on integrated device electronics (IDE) drives with caching enabled, you may receive the following error message during startup:

Stop: 0x000000D1 - Error Message When You Turn Your Computer Off
Microsoft Knowledge Base Article: 317326 - When you shut down your computer that has one or more universal serial bus (USB) devices attached to it.

Stop: 0x0000001E - Error Message During Windows Setup
Microsoft Knowledge Base Article: 314451 - When you run Windows XP Setup.

Stop: 0x0000007B - Errors in Windows XP
Microsoft Knowledge Base Article: 324103

Stop: 0x0000007B
Microsoft Knowledge Base Article: 314082 - After you move the system (boot) disk to a backup computer, you may receive the following Stop error when you try to start Windows XP.

Stop: 0x0000007F
Microsoft Knowledge Base Article: 314102

Stop: c0000218 {Registry File Failure} The registry cannot load the hive (file): \SystemRoot\System32\Config\SOFTWARE or its log or alternate. It is corrupt, absent, or not writable.
Microsoft Knowledge Base Article: 307545

Stop: C0000221 Unknown Hard Error **or**
Stop: C0000221 STATUS_IMAGE_CHECKSUM_MISMATCH
Microsoft Knowledge Base Article: 314474

Stop: 0xc000026C **or**
Stop: 0xc0000221 "Unable to Load Device Driver" - Error When You Start Windows XP
Microsoft Knowledge Base Article: 315241

Stop: 0x9F - Error in Windows XP
Microsoft Knowledge Base Article: 315249

HOW TO RECOVER FROM CHANGES TO WINDOWS XP

As a Windows administrator, there are times when changes are made to Windows XP that cause serious system problems. Fortunately, troubleshooting Windows XP to recover from these configuration changes can be easier than you might think -- depending on the changes that have been made.

The first troubleshooting trick for Windows XP involves the **Last Known Good Configuration** feature. This will reverse the most recent system and driver changes within the hardware profile, and If you are lucky and able to boot Windows XP using the Last Known Good Configuration, then there is nothing else that you need to do (i.e. Windows should boot successfully on the next attempt without you having to do anything special).

While that may seem simple enough, some admins still prefer to try and boot the system into **Safe Mode** and manually troubleshoot the problem. This involves booting Windows XP using a minimal set of drivers, making any necessary configuration repairs, and then booting Windows XP normally. The disadvantage to using Safe Mode is that it is only effective if you know how to fix the problem that rendered the system unbootable in the first place. The **Last Known Good Configuration** feature, on the other hand, usually fixes the problem even if you don't know what caused it.

Device driver rollback

Another troubleshooting technique for recovering from changes to Windows XP involves device driver rollback. This is useful when someone installs an invalid device driver, which can result in anything from a single hardware device not working to the entire Windows XP system being rendered unbootable.

It's difficult to protect against faulty device drivers because they pose so many potential problems. For example, although some are built into Windows XP, most are supplied by third-parties, and they require intimate contact with the guts of the system. They can also interact in odd ways, and a faulty one can cause problems at a point far removed from the applications it services. In short, like dynamic link libraries, device drivers don't just affect the application they are intended for. They can affect many other applications that are performing quite different tasks but occasionally use the services of the particular device driver in question.

To use the device driver rollback technique with Windows XP, simply boot into Safe Mode and open the Control Panel. Then click on the Performance and Maintenance link, followed by the System link. When you do, Windows will open the System Properties sheet. Select the sheet's Hardware tab and click the Device Manager button to open it.

When the Device Manager opens, scroll through the list of devices until you find the device that has an invalid driver associated with it. Next, right-click on that device and choose the Properties command from the resulting shortcut menu to access the device's properties sheet. Finally, select the sheet's Driver tab and click the Roll Back Driver button. Windows XP will now revert the device driver to the previous version.

Windows XP System Restore

There are a number of activities ranging from registry changes to software installations that can cause Windows XP configuration problems. In such situations, often you can troubleshoot with Windows XP System Restore to take your computer back to where it was prior to the change. Basically, Windows XP creates system restore points just prior to various types of configuration changes. If the change is catastrophic, then you can revert back to the system restore point.

Simple boot to **Safe Mode**, log in as an admin and select the following commands from the Start menu: All Programs > Accessories > System Tools > System Restore. When the Windows XP System Restore application loads, choose the Restore My Computer to an Earlier Time option and click Next. You will be taken to a screen that allows you to choose a point in time that you want to revert the system to.

It's important to remember that while System Restore can be very a helpful troubleshooting tool, it also isn't perfect, and is not a good substitute for a normal backup. System Restore information is stored on the drive that System Restore is protecting. Therefore, if a hard drive goes bad, then the System Restore information may be lost as well.

You also might need to troubleshoot Windows XP System Restore itself. If you find that you are unable to create or roll back system restore points, then the suggested troubleshooting technique is to reinstall System Restore. The one drawback to doing this is that all existing System Restore points will be deleted. If you need to get System Restore working, however, this may be a relatively small price to pay. Remember that if you have a virus or malware infection and System Restore still seems to be working properly (i.e., you can create restore points), do not attempt to reinstall System Restore until after you have dealt with the other issues. Reinstalling System Restore will delete all your existing restore points, and those restore points may be the only way to get back what's been damaged in Windows XP.

- Reinstall System Restore in Windows XP

The most common symptoms of a damaged System Restore installation in Windows are fairly obvious: You can't create System Restore points anymore, and you can't roll back to them either. Most users don't know this -- and many experts don't either.

It is possible, however, to reinstall System Restore and get it running again if the mechanisms for performing System Restore become damaged or unregistered. The one drawback to doing this is that all existing System Restore points will be deleted. But if you need to get System Restore working, this may be a relatively small price to pay.

1. Enable hidden and system files in Explorer if you haven't done so already. To do this, open Control Panel > Folder Options > View, and in Advanced Settings under Hidden Files and Folders, select "*Show hidden files and folders*". Below that, uncheck "*Hide protected operating system files.*" (You will probably want to restore this option later.)
2. From Start > Run, type **`%SystemRoot%\inf`** and press Enter.
3. Find the file named sr.inf. Right click on it and select Install.
4. You may be prompted for your Windows installation media or a directory on your hard drive that has the \i386 folder. If you installed Service Pack 2 (as opposed to installing a version of Windows XP with SP2 preinstalled), use the folder: **`%SystemRoot%\ServicePackFiles\i386`**

If you have a virus or malware infection and System Restore still seems to be working properly (i.e., you can create restore points), do not attempt to reinstall System Restore until after you have dealt with the other problems at hand. As I mentioned, reinstalling SR will delete all your existing restore points, and those restore points may be the only way to get back what's been damaged if it comes to that.

- Running System Restore from the Recovery Console (well, sort of)

One of the most commonly requested features in Windows is the ability to boot to the Recovery Console and perform a System Restore operation. There are times when it's simply not possible to boot Windows in safe mode to run System Restore, and the Recovery Console has no built-in way of running System Restore.

That being said, if you need to run System Restore to revert the system to an earlier version of the SYSTEM or SOFTWARE Registry hive, because of a corrupted Registry, it is possible to do this manually. This method is far from perfect and doesn't take into account any of the other changes that System Restore might track (such as changed .DLLs or other system components), but it will allow you to recover copies of the Registry in the event of a failure—provided they've been saved with System Restore and are available.

Here is the 12-step process:

1. Boot the Recovery Console from the Windows XP installation CD.

2. When you're at the Recovery Console command prompt, change into the root directory of the system drive with the **cd** command (i.e., **cd **).

3. Change into the **System Volume Information** directory by typing **`cd system~1`** on most machines, or **`cd "System Volume Information"`**.
   The filenames with ~1 are generated by default to provide backwards compatibility with programs that only recognize 8.3-format filenames. It's possible to disable 8.3 filename generation on NTFS volumes to gain some speed, but the speed gained by doing this is generally pretty small and it can have the unintended consequence of making it impossible to use 8.3 filenames in contexts like this. If you can't use 8.3 filenames to navigate, 8.3 name generation might be disabled. See Microsoft's support document called How to Disable the 8.3 Name Creation on NTFS Partitions.

4. The System Volume Information directory contains a folder name **`_restore`** followed by a GUID in curly braces. Change into it by typing **`cd _resto~1`**; if that doesn't work you'll have to type **`cd "_restore{GUID_STRING}"`**, with the full GUID string in place of GUID_STRING.

5. In the **`_restore`** directory are a group of subdirectories starting with the letters RP and followed by a number. These are the different restore points available for that volume.

6. Check the date on each directory and look for one that corresponds to a date before you began experiencing problems.

7. Change into the appropriate directory. If the directory is named RP74, for instance, change into it by typing RP74.

8. Inside that directory will be a subdirectory named **`snapshot`**; change into that directory as well (**`cd snapshot`**)

9. The snapshot directory holds backup copies of the SOFTWARE and SYSTEM Registry hives, named `_REGISTRY_MACHINE_SOFTWARE` and `_REGISTRY_MACHINE_SYSTEM`, respectively.

10. The target directory for these files is \Windows\System32\Config, and the hives there are named **SOFTWARE** and **SYSTEM**. Rather than overwrite those files entirely, you can rename them to something else. Typing:
```
ren \windows\system32\config\software windows\system32\config\software.bak
```
and
```
ren \windows\system32\config\system \windows\system32\config\system.bak
```
will rename them to software.bak and system.bak, respectively.

11. Copy in the backup hives:
```
copy _REGISTRY_MACHINE_SOFTWARE \windows\system32\config\software
```
and
```
copy _REGISTRY_MACHINE_SYSTEM \windows\system32\config\system
```

12. Type **exit** to leave the Recovery Console and restart the computer.

If you have an alternate operating system, such as a Linux live-recovery CD or another installation of Windows, that has access to the NTFS file system, you can perform the file copying from there as well, without having to struggle as much with the command line.

Windows XP Automated System Recovery (ASR)

The Automated System Recovery (ASR) feature in Windows XP Professional makes it easier to restore a Windows system if the operating system, Registry and related files on the system volume become corrupted. Like using a restore point, ASR rolls back the system to a known good state.

However, in XP Professional, ASR is much more powerful than restore points and requires careful use. In fact, Microsoft recommends that ASR only be used as a last resort before going through the process of wiping the disk and restoring everything from the installation CDs on up. ASR for Windows Server 2003 is related but different. For example, the procedure assumes you will be backing up over a network. Also, ASR reformats the system volume in the process of restoration.

Recovery with ASR in XP Professional is a two-step process. In the boot recovery process, a new copy of XP is installed on the system from the original CD. Next, restore a previously saved copy of the installation you're trying to recover. This overwrites some of the files installed in the boot recovery process and restores the system state.

To make this work, you need three things: an ASR recovery floppy (which you create and keep current yourself), an ASR backup and the original installation CD.

Use the ASR option in the Backup and Restore Wizard to create the ASR backup. This backs up not only the disks containing the operating system, but also the system state and related information. The ASR backup will amount to about 2 GB of data, so it is best done to another hard disk.

The ASR floppy is vital to the operation and needs to be kept current. Although there is a procedure for creating an ASR floppy from the backup media, it is much better to have a floppy with your current Registry and other system state information on hand.

Microsoft provides instructions on using ASR, but, the fact is, you're much better off if you can avoid ASR entirely. You should try other options such as system point restore, driver rollbacks and restoring from a regular backup before resorting to ASR.

Use ASR to restore Windows system only as a last resort

TROUBLESHOOTING WINDOWS XP HARDWARE ISSUES

The Windows XP Device Manager is a centralized console for configuring system hardware. If a piece of hardware is malfunctioning, the Device Manager will usually let you know about it. While that may seem simple enough, Windows XP Device Manager errors tend to consist of error codes and a brief, often cryptic description of the problem, and the tricky part involves deciphering and troubleshooting those error codes.

You access Device Manager by opening the Control Panel and clicking the Performance and Maintenance links, followed by the System link. Upon doing so, Windows will display the System Properties sheet. Select the properties sheet's Hardware tab, and click the Device Manager button. Windows will now open the Device Manager.

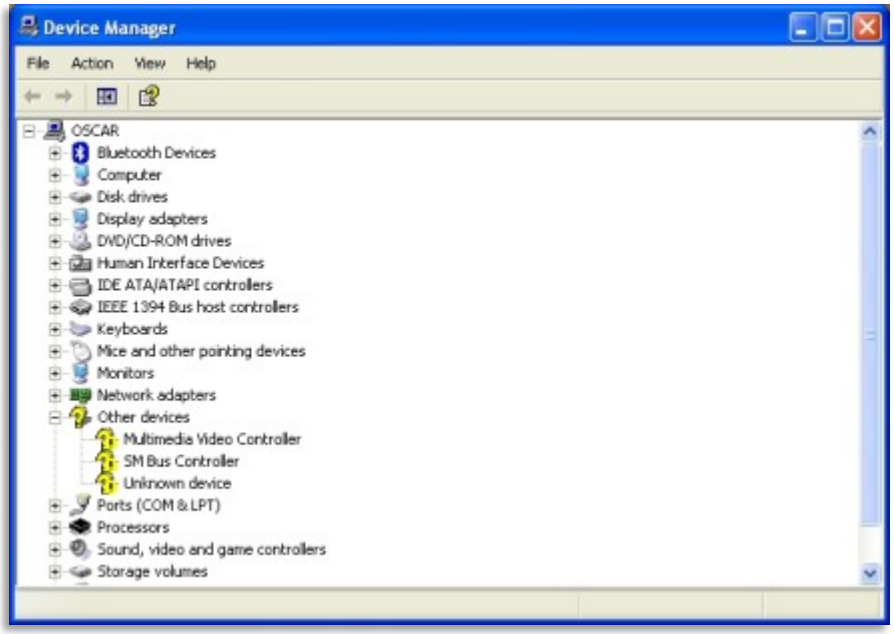


Fig. A

Device Manager is organized in a hierarchical fashion. Normally, the Device Manager will initially display only device categories. This keeps the view nice and clean, and you can simply expand a category to gain more information about the devices in that category.

The exception to this rule is that if a device is having problems, then the category containing the problem device will be expanded automatically upon opening Device Manager. For example, in Figure A, you can see three devices that are configured incorrectly and listed within the Other Devices section.

In this case, I know what the problem is: No drivers have been installed for these particular devices. I can tell the problem is driver related, because the screen capture was taken from my wife's computer, and I'm the one that set it up. If, however, I didn't al-

ready know what the problem was, I could simply right click on a device and select the Properties command from the resulting shortcut menu. Upon doing so, Windows would display the device's properties sheet, as shown in Figure B.

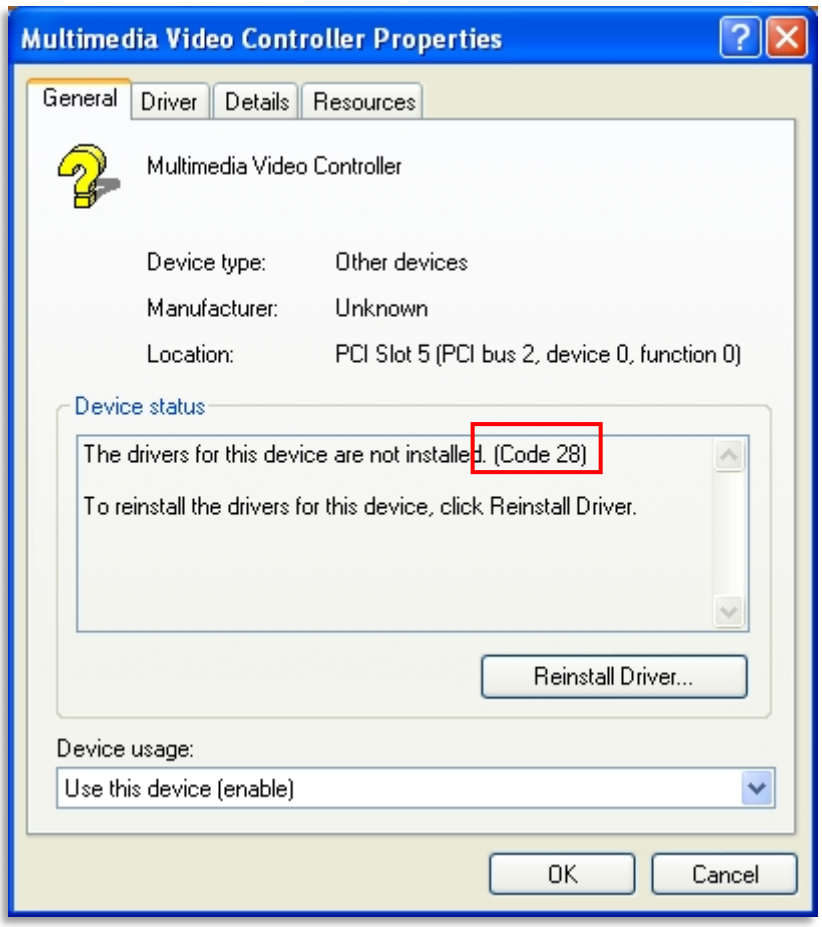


Fig. B

As you can see in the figure, the properties sheet's General tab contains a Device Status section. This section shows that the drivers for the device are not installed and that the error **code is 28**. It even tells me that I can click the **Reinstall Drivers button** to take care of the problem. It just doesn't get any easier than that.

Unfortunately, not all Device Manager errors are that easy to decipher. You will notice that the error codes are not sequential. This is because some of the Device Manager error codes that existed in other versions of Windows have been retired and are not used in Windows XP.

Now, let’s take a look at the error codes you can find in the Device Manager.

Device Manager Error Codes.

- Code 1

The Device is not Configured Correctly (Code 1) - This error message usually means that an incorrect device driver is associated with the device. Windows XP takes steps to prevent you from installing an invalid device driver, but the problem can occur if the system was upgraded from a previous operating system or if you take steps to circumvent the Device Manager.

To fix, I recommend visiting the hardware manufacturer's Web site and downloading the correct driver for the device.

- Code 3

The Driver for this Device May be Corrupt or Your System May be Running Low on Memory or Other Resources (Code 3) - In this case, the Device Status section actually gives you a pretty good description of the problem but not a lot of information about what to do about the problem. Initially, go with the assumption that the device driver is corrupt. That being the case, you should begin the process by downloading the latest version of the driver from the hardware manufacturer's Web site.

Once you have the new driver in hand, go to the Device Manager's Driver tab, shown in Figure C, and click the Uninstall button. This will remove the corrupt driver.

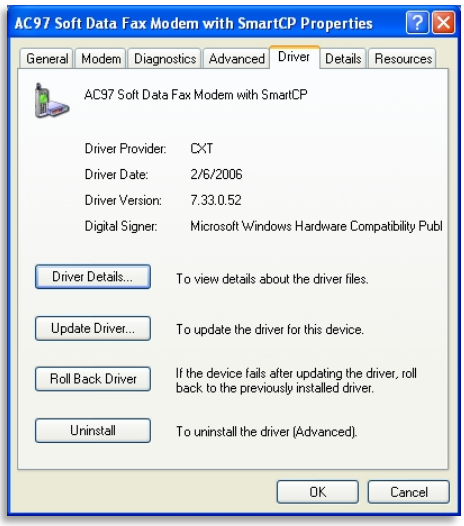


Fig. C

Once the corrupt driver has been removed, the error code should change from Error 3 to Error 1. Follow the steps in the section above to install the new device driver and correct the problem.

Error code 3 also cited a lack of system resources as a possible cause of the problem. In all of my years working with Windows XP, I have seen only one system that was so low on memory that a device driver refused to load, and that problem was because of a virus. Typically, if memory gets to be so low that a device driver can't be loaded, you are going to see some other rather severe performance and stability problems before the system ever gets to the point of rejecting device drivers.

Even so, if you want to check your system's available memory, the easiest way to do so is to press Ctrl+Alt+Delete and click the Task Manager button. When the Windows Task Manager opens, go to the Performance tab. In Figure D, the Performance tab shows you how much physical memory is installed in the computer and how much of that memory remains.

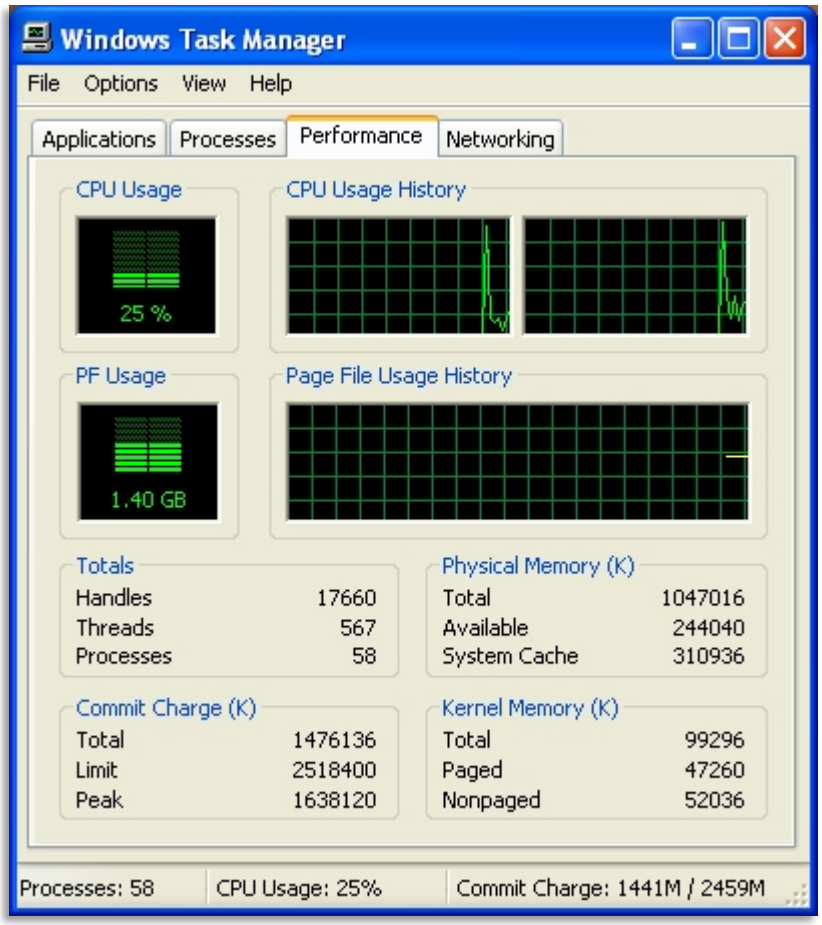


Fig. D

You can easily resolve some of the error messages produced by Device Manager. The first step in fixing the problem is knowing what the problem is.

- Code 10

Error code 10 is displayed when a device driver is not started. A lot of people don't realize it, but Windows XP treats device drivers very similarly to services. In fact, device drivers can be stopped and started just like a service can. The reason why a lot of people don't know this is because Microsoft doesn't provide us with a console similar to the Service Control Manager that can be used for stopping and starting device drivers.

Getting rid of error code 10 is fairly simple, provided that you have the correct driver installed and that driver isn't corrupt. I recommend uninstalling the device's driver and installing a freshly downloaded version prior to attempting the following tactic.

If you still can't get the device driver to start, open a Command Prompt window and enter the DRIVERQUERY command. As you can see in Figure A, this command provides you with some basic information about each device driver that is installed in the system. You should scroll through this list until you locate the device driver that is giving you trouble. Once you have located the correct driver, make note of its Module Name.

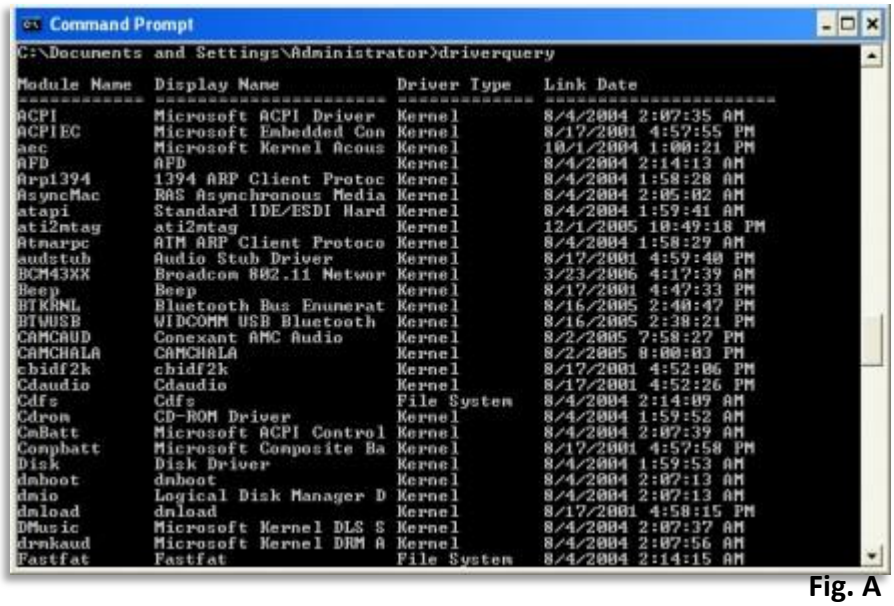
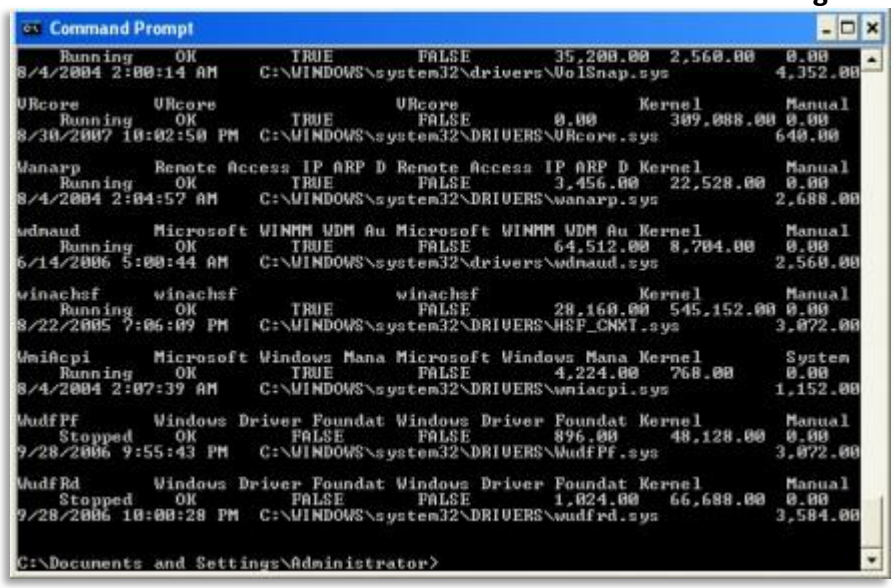


Fig. A

Now, what the DRIVERQUERY command doesn't tell you is whether or not the drivers are running. To see the status of each device driver, enter the DRIVERQUERY command again, but this time append the /V switch. This will cause DRIVERQUERY to run in verbose mode. In Figure B, you'll see that this command tells you which drivers are running and which ones have stopped.

You can use this information to verify what the Device Manager is telling you. Assuming that DRIVERQUERY reports a device as being stopped, you can use the NET command to start it. For example, Figure B shows that the Windows Driver Foundation Kernel has stopped. This is normal for my system, but let's pretend that the driver is having problems and needs to be manually started.

Fig. B



First, I would have to record the driver's module name, which is WudfRd. I can then plug this module name into the NET command, along with the start parameter. The actual command looks like this:

```
NET START
WudfRd
```

In this particular case, I receive an error message telling me that the driver can't start because the device is disabled, as shown in Figure C. Even so, this gives me something to go on. If this were a real-world problem, I could open the Device Manager, enable the offending device and then re-enter the **NET START WudfRd** command. That should make the problem go away.

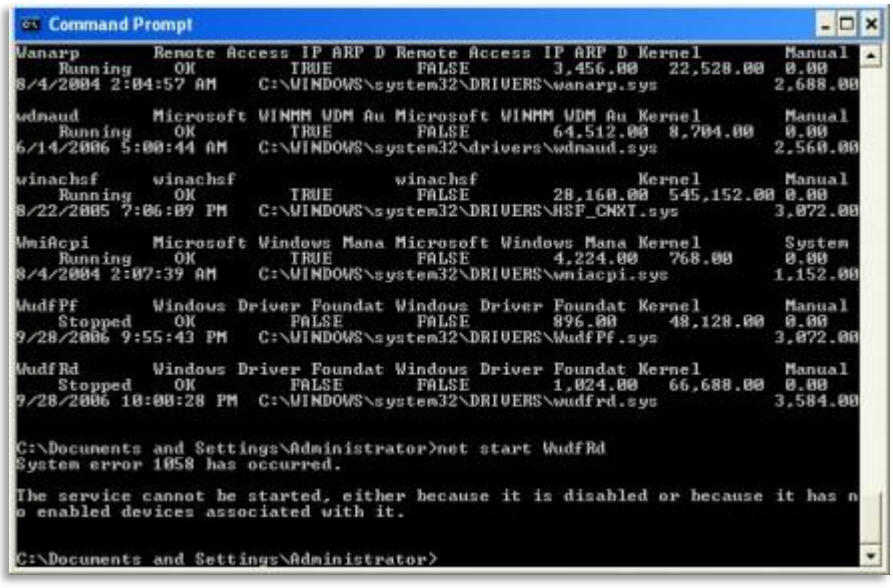


Fig. C

- Code 12

Error code 12 is one of those errors I hope you won't ever receive, because fixing the problem can be rather difficult. There are two different things that can trigger this error. The most common problem is a resource conflict. Essentially, this means that two hardware devices have been assigned overlapping resources. The overlapping resources might be IRQs, DMAs or even memory address ranges.

Newer systems that are fully plug-and-play compliant and use only PCI-based devices typically do not experience this problem. However, some systems still include one or more ISA expansion slots. Any time that ISA comes into the picture, hardware resource conflicts can become an issue. PCI-based systems are not exempt from the problem though. If someone has attempted to manually configure the resources that PCI devices are using, then a resource overlap is possible.

Troubleshooting and correcting resource overlaps is a very tedious process. For a quick and dirty fix, you can disable one of the devices that is using overlapping resources. Then the other device that requires those resources will usually begin to function. If you are looking for a more in-depth, step-by-step solution to this error, check out ***Page 34 - Manually troubleshooting hardware issues***

A corrupt Multiprocessor System (MPS) table can also cause error code 12. If the MPS table is corrupt, it can cause the BIOS to allocate insufficient resources to hardware devices. I have had a really tough time locating information regarding a solution to this problem. From what I have been able to tell, though, it appears that an MPS table can become corrupt as a result of a damaged hardware abstraction layer (HAL). If that is the case, then reinstalling Windows may fix the problem. If anyone knows for sure how to fix a corrupt MPS table, please send me an email.

- Code 14

Error code 14 is by far the simplest Device Manager error that you will ever encounter. This error simply indicates that the device cannot function properly until you reboot the system.

- Code 16

In most cases, you will only receive error code 16 on Windows XP systems that are running legacy or non-plug-and-play hardware. The actual error code indicates that Windows XP could not identify all of the resources that the device uses. Fortunately, correcting this problem is fairly easy.

To begin, open the Device Manager, right-click on the device that is experiencing difficulties and select the Properties command from the resulting shortcut menu. Upon doing so, the Device Manager will display the device's properties sheet. Go to the properties sheet's Resources tab and look for the identified resource. The unidentified resource will be designated with a question mark.

The technique for assigning resources varies from device to device. In most cases, you should be able to just select a new resource from the drop-down list. If Windows XP will not allow you to do this, then verify that the Use Automatic Settings check box is cleared and then click the Change Settings button.

- Code 18

This particular error code indicates that Windows XP requires the device's driver to be reinstalled. Typically, you will only receive this error if the device driver has been damaged. The easiest way of troubleshooting this problem is to right-click on the device that is experiencing difficulties and then select the Uninstall command from the resulting shortcut menu. Once the device driver has been uninstalled, simply scan for hardware changes and Windows will give you an opportunity to install a new device driver.

- Code 19

This is one of the more difficult errors to troubleshoot. Error code 19 indicates that the registry entries related to the device are corrupt. Specifically, there are three different registry problems that can cause this error to occur. Those conditions are:

- Multiple services are defined for a device
- A failure occurs while opening the service subkey
- Windows cannot obtain the driver name from the service subkey

If you do an Internet search on this particular error code, you'll find many different courses of action. I tend to think that the best thing to initially try is to boot Windows XP using the Last Known Good Configuration. Other options include uninstalling the driver and scanning for hardware changes or launching the Troubleshooting Wizard by clicking the Troubleshoot button found on the General tab of the device's properties sheet.

Unfortunately, it seems Microsoft does not publish specific instructions on how to manually correct this problem by editing the registry. This means that if none of the other repair techniques work, you may find yourself having to restore a backup or reinstall Windows XP.

- Code 21

Error code 21 usually involves a situation in which the administrator is faster than the computer. This error code means that Windows is in the process of removing the device, but that the process has not yet been completed. Most of the time, you can just wait a few seconds, press the F5 key and the error will go away. If that doesn't fix the problem, then a reboot usually will.

- Code 22

This error simply indicates that a device has been disabled. When a device is disabled, a large red **X** will appear over the device's icon.
You can make the error go away by re-enabling the device. To do so, right-click on the device and choose the Enable command from the resulting shortcut menu.

- Code 24

Error code 24 is one of the more generic Device Manager error codes. It indicates that the device is either not present, not working properly or does not have all of the necessary drivers installed.

Because this error code can mean several different things, troubleshooting the problem can be a bit tricky. If it seems that Windows XP thinks that the device is not present, then the problem could be bad hardware or you may have an outdated driver that does not fully recognize the hardware.

Occasionally, you may also find that error code 24 occurs if the device has been prepared for removal, but has not yet been removed. In such cases, the error should go away as soon as the device is removed.

Microsoft's recommended course of action for the problem is to run the Troubleshooting Wizard. You can access this wizard by clicking the Troubleshooting button found on the General tab of the device's properties sheet.

- Code 28

This is one of the more common error codes. It indicates that no drivers are installed for the device. You can correct this problem by right-clicking on the device and choosing the Update Driver command from the resulting shortcut menu.

Manually troubleshooting hardware issues

Although plug-and-play technology has become fairly reliable as it has matured, in some cases, it still doesn't work perfectly. For example, to this day there are still system boards that contain ISA expansion slots, which allow modern PCs to use legacy devices. Sometimes ISA-based devices can interfere with PCI devices.

Likewise, some x86 system boards use IRQ sharing across two or more PCI slots. Most of the time this arrangement works well, but sometimes conflicts do occur.

If you don't happen to have an ACPI-based system, or a system that allows you to toggle between ACPI and non-ACPI modes, then you may be able to resolve hardware conflicts by manually reallocating hardware resources.

- Before you begin – be forewarned

The technique I am about to show you is very similar to a resource allocation technique that used to be common for systems running Windows 95, Windows 98 and Windows ME. While you can generally use this technique without consequence in a Windows 9x or a Windows ME environment, Windows XP is a much more sophisticated operating system. Depending on the change you make, it is possible that you will receive a Blue Screen of Death, citing a STOP: 0x00000079 error.

When this error occurs, it is because the HAL (Hardware Abstraction Layer) no longer matches the machine's hardware configuration. If this happens, you will have to perform a clean Windows installation (an upgrade won't work).

My point is that the following technique should allow you to resolve any hardware resource conflicts, but you must be prepared to install Windows from scratch if necessary.

- Resolving hardware conflicts

Generally speaking, you must ensure that each hardware device has both a unique IRQ and memory range. If a hardware device uses a DMA, then that should be unique as well.

> ***Note:*** *As I mentioned earlier, most modern systems are designed to use IRQ sharing, but if you are reading this, then I'm assuming that IRQ sharing isn't working for one reason or another.*

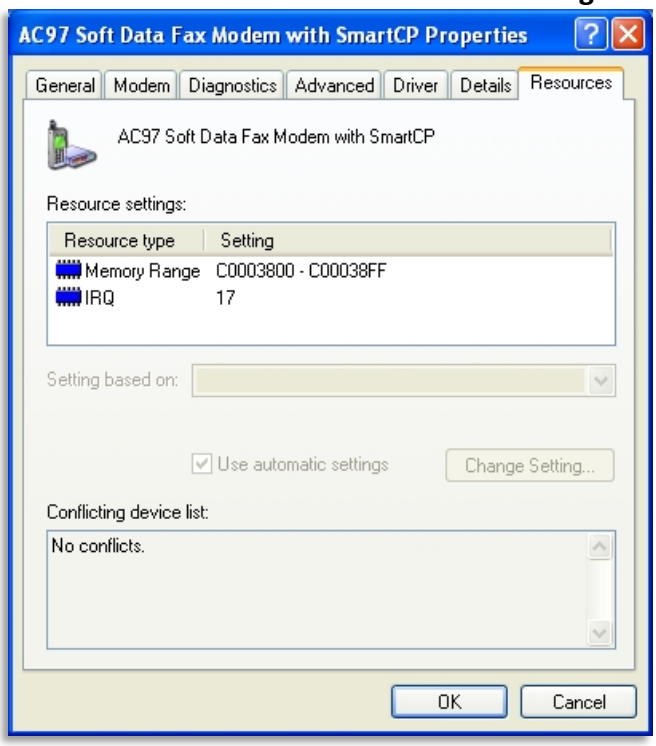
When resource conflicts occur, typically either one or both of the conflicting devices won't work. That being the case, your goal is to eliminate the conflict so that both devices can work. Incidentally, if you don't need both devices, then you can save yourself a whole lot of effort by simply disabling or removing the device that you don't need. To

disable a device, simply right click on it in the Device Manager, and select the Disable command from the resulting shortcut menu. When you do, the device will be flagged with a red **X**, as shown in Figure A.

Fig. A

If you do need to manually reallocate the resources that a device is using, then right click on the device and select the Properties command from the resulting shortcut menu. When you do, Windows will display the device's properties sheet. Now, select the properties sheet's Resources tab.
As you can see in Figure B, the Resources tab lists the memory range and the IRQ that the device is using. If the device were using a DMA, that would be listed as well.

Fig. B



At this point, you must deselect the Use Automatic Settings check box. If this check box is not available, then your system probably uses the ACPI HAL, which ignores IRQ assignments that are stored in the firmware.

Now, select the resource that you want to reassign and click the Change Setting button. You will now have the opportunity to assign a different set of resources to the device. Notice the Device Conflict List at the bottom of Figure B. Windows compares the currently selected resources with those used by other devices and lists any conflicts. If any conflicts are listed, then you must choose different resources.

Once you have resolved the conflict, click OK and hope for the best. If you receive a STOP: 0x00000079 error, then it's time to reinstall Windows. Remember, this must be a clean install, not an upgrade.

USB and printer problems

Universal Serial Bus is the standard for connecting USB devices from printers to external USB hard drives on Windows XP computers. Unfortunately, transferring files between a USB 2.0 hub and a Windows XP system can fail in several strange ways. For example, if you are using a USB keyboard, the transfer may fail. Troubleshooting problems like this is fairly simple, as Microsoft has issued a **hotfix** to solve the issue. For most hardware related problems, though, it's not that easy.

Printer driver and hardware incompatibilities are often at the heart of many printer problems, especially if you are using the 64-bit edition of Windows XP. Most often, the issues involve hardware drivers since so many low-end or inexpensive hardware devices that have 32-bit drivers for Windows XP do not have a corresponding 64-bit version. This problem can be solved failty easily with printers that use PCL or PostScript, but printers that use the driver to perform the actual rasterization but have no 64-bit driver, it creates a problem, as in this case 32-bit hardware drivers cannot be used at all.

So unless the hardware manufacturer changes its tune, or unless you decide to swap in a device that has 64-bit driver support, there is no easy workaround for the problem. One that is frequently suggested – installing the printer on another computer with 32-bit driver support and sharing the printer out -- doesn't work either, because the other computer still needs a 64-bit driver to print to it.

I found a workaround that's elaborate, but functional. A user had a 32-bit machine with a printer attached to it, and whenever he needed something printed, he simply dropped the file from the 64-bit machine into the 32-bit computer's shared files folder. If the application needed to do the printing wasn't available on the target machine, he used a 64-bit PostScript printer driver to produce a .PS file, which he could then rasterize on the target machine. (His chosen way to do this was to use Adobe Acrobat).
Microsoft has a generic PostScript driver in 64-bit Windows, the MS Publisher Imagesetter, that should handle most output-to-PostScript jobs. For the best possible flexibility, set default settings for the printer's PostScript options as follows:

TrueType Font: Download as Softfont
PostScript Output Option: Optimize for Portability
TrueType Font Download Option: Outline
Send PostScript Error Handler: Yes
Compress Bitmaps: Yes

These settings can be found in the printer's Properties pane, under General|Printing Preferences|Advanced. (You'll need to expand all the available trees to see each option).

Troubleshooting print queue overload and network congestion

Common network printer problems involve print queue overload, which is caused by too many users trying to print at the same time. For admins using Windows XP with Windows Server 2003, one way to troubleshoot this problem is by *creating a printer pool* **(page 37)**, which is a group of printers attached to a common print queue, allowing multiple documents to be printed at the same time. Once the printer pool is created, users can print to the pool by connecting to it using a defined share, immediately reducing print queue overload.

There is more than one cause of network printer congestion, too. For example, frivolous users send out large and unnecessary print jobs, it can slow everything down. If you notice that a particular user has a reputation for printing large jobs and creatibg problems, you can troubleshoot the problem be *creating a priority print queue* **(page 39)** just for that user. If you are looking for freeware to put an end to printer congestion, there are several usefull options out there, such as PaperCut.

- How to create a network printer pool

Network printing allows more than one user to share a common printer. But when too many users try to print at the same time, a network printer can become congested.
One way around this problem is to create a printer pool -- a group of printers attached to a common print queue, so multiple documents can be printed simultaneously.
There are three prerequisites to creating a printer pool in a Windows Server 2003 environment.

- All the printers in the printer pool be identical to each other. Since you never know which printer will print a user's document, all the printers must work with the same device driver. Moreover, all the printers need to have the same capabilities. (After all, what would happen if a user tried to print a document in color, and one of the printers in the pool did not support color printing?) When every device in the printer pool is of the same make and model, you can avoid these compatibility issues.

- The printer pool must be hosted on a Windows Server 2003 server. The printers don't actually have to be physically attached to the server, but the print queue must exist on a server. This print queue must then be shared so that users can print to the network print queue.

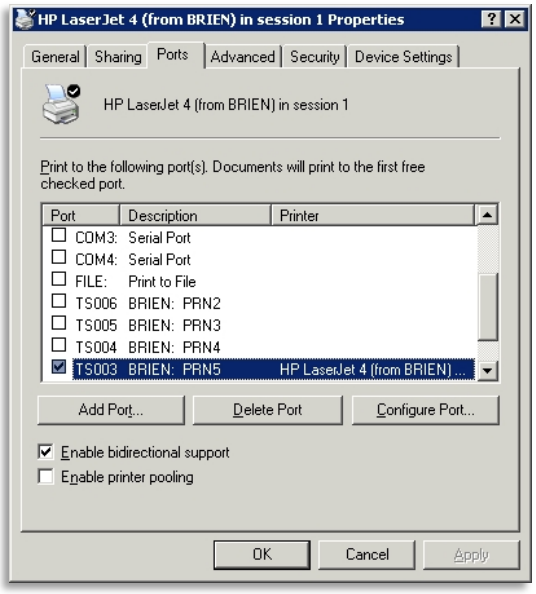
- All the printers in the print pool need to be located in the same place. (This is more a matter of practicality than a requirement.) If the printers in the pool are scattered, users will be running all over the building to figure out where their documents printed.

- Create a printer pool step-by-step

To create a printer pool, begin by choosing the Printers and Faxes command from your server's Start menu. When the Printers and Faxes window opens, double-click the Add Printer icon. Windows will now launch the *Add Printer Wizard*.

The Add Printer Wizard does not address the issue of creating a printer pool in an obvious way. The easiest thing to do is to pick one of the printers that will be included in the pool and pretend that printer will be the only printer you're setting up. So just answer the wizard's prompts as though you wanted to be able to print from the server to your chosen printer.

Once you've established an initial connection to a printer in the pool, you can concentrate on creating the pool itself. Right-click on the icon for the newly defined printer, and choose the Properties command from the resulting shortcut menu. You'll see the printer's properties sheet. Select the properties sheet's Ports tab, then select the Enable Printer Pooling check box, shown here.



Next, select the check boxes corresponding to any other ports which the other printers in the pool are attached to. LPT and COM ports are nearly extinct today. Your printers are probably directly attached to the network. If that's so, you'll have to click the Add Port button and define a port that corresponds to each of the network printers you want to include in the pool.

Now you'll be asked if you want to define a local port or a standard TCP/IP port. Choose the Standard TCP/IP port option and click Next. Windows will now launch the Add Standard TCP/IP Printer Port wizard. Click Next to bypass the wizard's Welcome screen. A screen will now ask you for a printer name (or IP address) and a port name.

I'm assuming that the printer already has an IP address assigned to it, so just enter that address into the space provided. You can enter anything you want for the port name, but the port name must be unique. By default, Windows will create a port name of IP_, followed by the printer's IP address.

Click Next and you'll see a summary screen displaying the options you've chosen. Click Finish and the port will be created. Repeat this process for each printer that will be included in the pool. Once you've defined all the necessary printer ports, select the check boxes corresponding to each port you want to use.

The final step in the process is to share the printer. Go to the properties sheet's Sharing tab and select the Share this Printer button. You'll be prompted to enter a share name for the printer, and you should also select the List in the Directory check box. Click OK.

Now you've created your printer pool. Users can print to the pool by connecting to it using the share you just defined.

- Creating a priority print queue

Prioritized print queues allow you to configure network printing in such a way that a user with a reputation for frivolous printing will never disrupt users who are trying to do legitimate work.
Sure, it's possible for admins to simply delete a user's job from the print queue when it ties up a printer for hours. But a priority print queue is a much more reliable and efficient solution to this perennial problem. And, they are easy to set up because Windows allows you to connect multiple print queues to a single physical printer. To prioritize network printing, all you have to do is to point these multiple print queues to the same physical printer.
The procedure for doing so is no different than the way that you would set up any other network printer. However, there are two important differences:

- Each print queue should be assigned a different local name and share name.

- The print queues – both low and high priority -- must be hosted by a Windows server. Creating a low priority print queue on a user's workstation won't have the desired effect; users must send documents through these shared print queues in order for prioritization to work correctly.

Once you've created and tested the various print queues, you can begin prioritizing.

Step 1: Lock the troublesome user out of your primary print queue.

Right click on your primary print queue, and select the Properties command from the resulting shortcut menu. You'll see the printer's properties sheet. You can use the properties sheets Security tab, shown in Figure A, to deny print rights to the troublesome user. This will prevent the user from simply connecting to a print queue that has been assigned a higher priority.

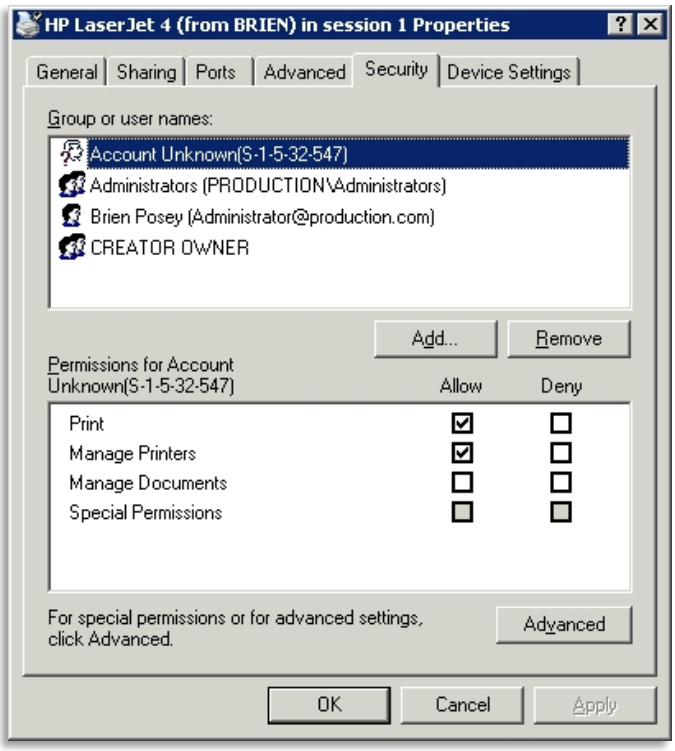


Fig. A

Step 2: Assign a priority to the print queue that you have created for the troublesome user.

Go to the properties sheet's Advanced tab. As you can see in Figure B, the Advanced tab contains a Priority setting. By default, all network printers have a priority setting of 1. The lower the priority setting, the higher the priority. Therefore, you'll want to use a number that is higher than 1 for your low priority print queue.

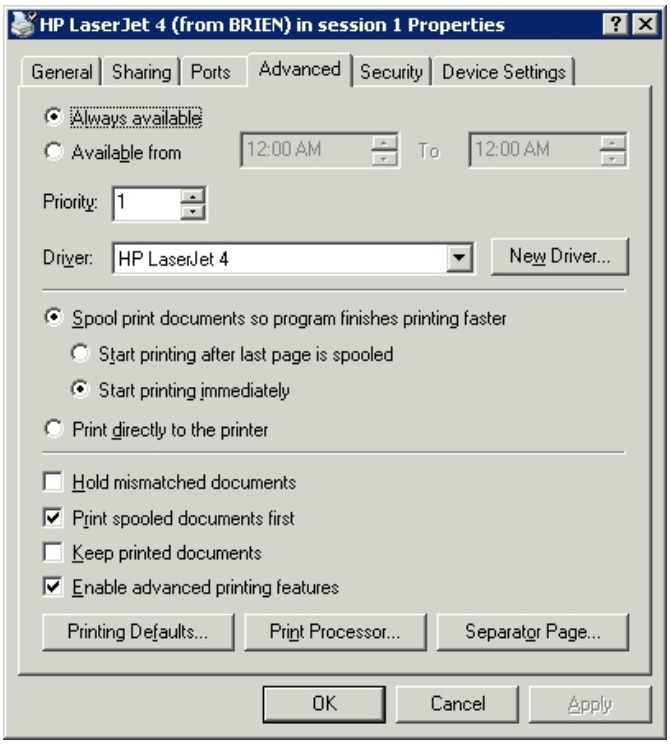


Fig. B

You might also notice in the figure that the Advanced tab allows you to configure the times a day when the printer is available. You can use these settings to prevent a troublesome user from coming in to the office late at night and printing something. Availability settings are applied to specific print queues, so you can limit the hours that the printer is available to the troublesome user, without impacting the other users.

Other Hardware Issues

A Partial List of Driver Error Codes That the Driver Verifier Tool Uses to Report Problems
Microsoft Knowledge Base Article: 315252

How Processor Speed Is Reported to a Computer
Microsoft Knowledge Base Article: 312104

How to Determine Which Video Driver Is Loading in Windows XP
Microsoft Knowledge Base Article: 314854

How to Troubleshoot CD-ROM Drive Problems in Windows XP
Microsoft Knowledge Base Article: 314096

How to Troubleshoot Hardware and Software Driver Problems in Windows XP
Microsoft Knowledge Base Article: 322205

How to Troubleshoot the Video Adapter Driver in Safe Mode
Microsoft Knowledge Base Article: 292460

How to Use Driver Verifier to Troubleshoot Device Drivers in Windows XP
Microsoft Knowledge Base Article: 244617

Resources for Troubleshooting Sound Problems in Windows XP
Microsoft Knowledge Base Article: 307918

Resources for Troubleshooting Modem Problems in Windows XP
Microsoft Knowledge Base Article: 308022

Resources for Troubleshooting Games and Multimedia in Windows XP
Microsoft Knowledge Base Article: 310697

Troubleshooting Cable Modems
Microsoft Knowledge Base Article: 310089

CD-ROM May Not Run Automatically in Windows XP
Microsoft Knowledge Base Article: 314855

TROUBLESHOOTING HANG CONDITIONS

An Error Message Appears with an Asus Video Adapter in Windows XP
Microsoft Knowledge Base Article: 309126

Computer Hangs During Shutdown or Displays a "Cannot Find Enough Free Resources" Error Message
Microsoft Knowledge Base Article: 314101

Computer Hangs if USB Selective Suspend Option of USB Mouse Is On
Microsoft Knowledge Base Article: 317673

Computer Hangs When You Resume from Hibernation or Standby if Your Ultra Bay Has a UDMA Device
Microsoft Knowledge Base Article: 317087

Computer Stops Responding After It Restarts During Windows XP Setup
Microsoft Knowledge Base Article: 307551

Computer Stops Responding When You Install Windows XP on a Computer with an i815 Chip Set Motherboard
Microsoft Knowledge Base Article: 282195

Computer Stops Responding with a Black Screen When You Start Windows
Microsoft Knowledge Base Article: 314503

Computer Stops Responding When Shim Code Has a Buffer Overrun
Microsoft Knowledge Base Article: 308035

Msconfig.exe Stops Responding if User Is Not an Administrator
Microsoft Knowledge Base Article: 314448

Windows Explorer May Stop Responding When You Close a Window
Microsoft Knowledge Base Article: 315094

Your Computer May Hang If You Unexpectedly Remove a PC Card Storage Device While the Computer Is in Standby
Microsoft Knowledge Base Article: 311822

You Computer May Pause with a Black Screen If You Press ESC During Startup
Microsoft Knowledge Base Article: 311799

TROUBLESHOOTING NETWORK CONNECTIVITY ISSUES

Basic L2TP/IPSec Troubleshooting in Windows XP
Microsoft Knowledge Base Article: 314831

General Troubleshooting for IEEE 1394 Devices and Host Controllers
Microsoft Knowledge Base Article: 314873

How to Troubleshoot Possible Causes of Internet Connection Problems
Microsoft Knowledge Base Article: 314095

How to Troubleshoot TCP/IP Connectivity with Windows XP
Microsoft Knowledge Base Article: 314067

How to Troubleshoot Wireless Network Connections in Windows XP
Microsoft Knowledge Base Article: 313242

How to Use TRACERT to Troubleshoot TCP/IP Problems in Windows
Microsoft Knowledge Base Article: 314868

How to Write an LMHOSTS File for Domain Validation and Other Name Resolution Issues
Microsoft Knowledge Base Article: 314108

Inbound Connections Limit in Windows XP
Microsoft Knowledge Base Article: 314882

"Ping: Transmit Failed, Error Code 65" Error Message When You Attempt to Ping Another Computer
Microsoft Knowledge Base Article: 316414

SSL Connection Does Not Work on Windows XP
Microsoft Knowledge Base Article: 314864

TCP/IP Functionality and Internet Connectivity Are Disrupted When You Uninstall McAfee Personal Firewall
Microsoft Knowledge Base Article: 316522

WINDOWS XP PERFORMANCE TUNNING

Windows XP offers excellent overall performance-which includes dramatically faster boot and resume times, along with highly responsive applications. This white paper addresses some of the key performance improvements in Windows XP, and highlights some of the issues you should keep in mind when evaluating a system configuration.

Description of the Windows XP Logman.exe, Relog.exe, and Typeperf.exe Tools
Microsoft Knowledge Base Article: 303133

This article provides a description of the Windows XP Logman.exe, Relog.exe, and Typeperf.exe command-line tools you can use in conjunction with, or separate from, System Monitor and the Performance Logs and Alerts snap-in.

Description of Performance Options in Windows
Microsoft Knowledge Base Article: 259025

This article describes the performance options in Windows

Performance Benchmarking on Windows XP
This article discusses some of the built-in performance tuning features of Windows XP

How to Set Performance Options
Microsoft Knowledge Base Article: 308417

Windows allocates resources according to its settings and manages devices accordingly. You can use the System tool in Control Panel to change performance options that control how programs use memory, including paging file size, or environment variables that tell your computer where to find some types of information. This article explains how to set the performance options for your computer.

Using Performance Monitor To Identify A Pool Leak
Microsoft Knowledge Base Article: 130926

A memory leak occurs when a memory pool allocates some of its memory to a process and the process does not return the memory. When this happens repeatedly, the memory pool is depleted.

Windows Print Spooler Performance Enhancements
Microsoft Knowledge Base Article: 240683

Windows includes several print spooler optimizations designed to significantly reduce startup time. This article lists these print spooler enhancements.

How to Configure Paging Files for Optimization and Recovery in Windows XP
Microsoft Knowledge Base Article: 314482

The paging file (Pagefile.sys) is a hidden file on your computer's hard disk that Windows XP uses as if it were random access memory (RAM). The paging file and physical memory comprise virtual memory. By default, Windows stores the paging file on the boot partition (the partition that contains the operating system and its support files). The default, or recommended, paging file size is equal to 1.5 times the total amount of RAM. This article discusses how you can configure the paging file for system optimization and recovery

How to Overcome 4,095-MB Paging File Size Limit in Windows
Microsoft Knowledge Base Article: 237740

When you are setting the paging file size in Windows, the documentation states that the largest paging file you can select is 4,095 megabytes (MB). This is the limit set per volume; you can actually create paging files this large on one or more drives if you need a larger paging file. If extra drives or volumes are not available, you can create multiple paging files on a single drive by placing them in separate folders.

How to View and Manage Event Logs in Event Viewer
Microsoft Knowledge Base Article: 308427

WINDOWS XP SECURITY

Although both Professional and Home Edition versions of Windows XP are miles ahead of Windows 95/98/Me, only Windows XP Professional can come close to the venerated Windows NT/2000 security standards.

Basic Security Measures

Provide Physical Security for the machine

It may seem basic, but we didn't want you to overlook the obvious. The simple fact is that most security breaches in corporate environments occur from the inside. Keep your workstation in an office that locks, install a lock on the CPU case, keep it locked, and store the key safely away from the computer at a secure location. (i.e. a locked cabinet in the server room)

Use NTFS on all your partitions

The FAT16/FAT32 file systems that were shipped with Windows 95/98/ME offered no security for your data and left your system wide open to attacks. The NTFS file system is faster than FAT32 and allows you to set permissions down to the file level. If you're unsure of how your system is configured, open **My Computer**, right click on the drive letter you want to check, and select "**Properties**" from the menu. If your Windows XP system was preconfigured with the FAT16 or FAT32 file system, you can convert the partitions quickly and easily using the convert.exe utility. (If you choose to convert to NTFS, you cannot go back to the FAT or FAT32 file system unless you reinstall XP) In addition, using NTFS on Windows XP Professional allows you to encrypt files and folders using the Encrypting File System (EFS). If you are dual booting Windows XP and Windows 9x/Me, keep in mind that these operating systems cannot read NTFS partitions, and you won't be able to access the files when you are in Windows 9x/ME.

Disable Simple File Sharing

Both Windows XP Home Edition and XP Professional workstations that are *not* part of a domain, use a network access model called "Simple File Sharing," where all attempts to log on to the computer from across the network are forced to use the Guest account (to prevent them from using a local Administrator account that wasn't configured with a password) This means that if you're connected to the internet and don't use a secure firewall, your files contained within those shares are available to just about anybody.

- Click Start > My Computer > Tools > Folder Options
- Select the View tab
- Go to Advanced Settings,
- clear the Use Simple File Sharing box
- click Apply

Unfortunately, XP Home Edition doesn't allow you to disable Simple File Sharing and is unable to join a domain, so the best you can hope for is to make sure you set your shared folders to be read only, hide the file shares by using a $ sign after the folder name, or if your using the NTFS file system, use the 'Make Private" option in the folder properties. Windows XP Professional workstations that are part of a domain or that have Simple File Sharing disabled, use the "Classic" NT security model that requires all users to authenticate before granting access to shared folders. For more information on File Sharing in XP, see KB Article 304040.

Use passwords on all user accounts

Both Windows XP Professional and Home Edition allow user accounts to utilize blank passwords to log into their local workstations, although in XP Professional, accounts with blank passwords can no longer be used to log on to the computer remotely over the network. Obviously, blank passwords are a bad idea if you care about security. Make sure you assign passwords to all accounts, especially the Administrator account and any accounts with Administrator privileges. By the way, in XP Home Edition all user accounts have administrative privileges and no password by default. Make sure you close this hole as soon as possible

Use the Administrator Group with care

It's very common for home users and small business administrators to simply give all local accounts full Administrator privileges in order eliminate the inconvenience of logging into another account. However this practice gives a hacker the opportunity to try to crack a greater number of administrator level accounts and increases his/her chance for success. It also increases the odds that malicious code executed via an e-mail attachment or other vector can do more damage to your files. In a workgroup consider placing local users with a greater need for control in the local Power Users group, instead of the Administrators group. And avoid the temptation of using the local administrator account as your default login account.

Disable the Guest Account

The guest account has always been a huge hacker hole, and should be disabled as soon as you install your workstation. Unfortunately, this setting recommendation only applies to Windows XP Professional computers that belong to a domain, or to computers that do not use the Simple File Sharing model. Windows XP Home Edition will not allow you to disable the Guest account. When you disable the Guest account in Windows XP Home Edition via the Control Panel, it only removes the listing of the Guest account from the Fast User Switching Welcome screen, and the Log-On Local right. The network credentials will remain intact and guest users will still be able to connect to shared resources of the affected machine across a network. Microsoft Knowledge Base Article: 300489 de-

scribes this behavior and states that it is by design. The best workaround for XP Home Users is to assign a strong password to the Guest account.

Use a firewall if you have a full time internet connection

Having instant, high speed access to the internet is a real convenience but it also puts your data at risk. Although XP comes with a built in firewall (called ICF), it is not enabled by default, and it only filters incoming traffic without attempting to manage or restrict outbound connections at all. While this may be fine for most users, we highly recommend using a third party personal firewall. For corporate users already behind a firewall, consider using Group Policy to enable ICF and disable specific ports when users are not connected to the corporate network. For more information on ICF, see: How to Enable or Disable Internet Connection Firewall in Windows XP (Q283673)

Install Antivirus Software on all workstations

Viruses and other forms of malicious software have been around for years, but today's malware utilizes the internet and e-mail systems to spread globally in a matter of hours. Installing Antivirus software is a basic step in protecting your data, but it's near useless if the definitions aren't updated.

Keep up to date with hotfixes and service packs

Windows XP is a complex operating system and is not immune to its own bugs and security holes. Its common tactic for hackers to use the latest known security hole to break into a system and work backward from there until they find an open door that gives them full access. In fact 99% of system breaches are executed using known security vulnerabilities that were never patched. Use the Windows Update feature or automatic update to keep your system up to date. You can also use the Microsoft Baseline Security Analyzer to check your system for known vulnerabilities.

To enable automatic update in Windows XP:

- Click Start > Control Panel > Performance and Maintenance > System.
- On the Automatic Updates tab, click the setting of your choice

Secure your Backup tapes

It's amazing how many organizations implement excellent platform security, and then don't encrypt and/or lock up their backup tapes containing the same data. It's also a good idea to keep your Emergency Repair Disks locked up and stored away from your workstations as well.

Intermediate Security Measures

Use the Security Configuration Manager and templates provided with XP Professional
The Security Configuration Manager (SCM) set of tools allows security administrators to define security templates that can be applied to individual machines or any number of machines via group policy. Security templates can contain password policies, lockout policies, Kerberos policies, audit policies, event log settings, registry values, service start-tup modes, service permissions, user rights, group membership restrictions, registry permissions and file system permissions. Microsoft provides a number of predefined security templates to help you lock down your PC via Group Policy. These templates represent low, medium, and high security configurations, which can be customized to meet your specific security needs. The security relevant registry values configurable by SCM appear under Local Policies\Security Options when using SCM tools such as the security templates snap-in, the security configuration and analysis snap-in, or the security settings extension to Group Policy.
Note: This feature is not available on Windows XP Home Edition

Password Security
A good password policy is essential to your network security, but is often overlooked. In large organizations there is a huge temptation for lazy administrators to create all local Administrator accounts (or worse, a common domain level administrator account) that uses a variation of the company name, computer name, or advertising tag line. i.e. *%companyname%*#1, win2k*%companyname%,* etc. Even worse are new user accounts with simple passwords such as "welcome", "letmein", "new2you", that aren't required to changed the password after the first logon. Use complex passwords that are changed at least every 60 -90 days. Use Group Policy or the local computer policy to set restriction on password age, length, complexity, lockout duration, and number of bad attempts. (Click **Start** > **Run** > type **GPEDIT.MSC** > Go to **Computer Configuration** > **Windows Settings** > **Security Settings** > **Local Policy** > **Security Options**) Passwords should contain at least eight characters, and preferably nine (recent security information reports that many cracking programs are using the eight character standard as a starting point). Also, each password must follow the standards set for strong passwords. The basic goal is that the password should be complex enough to foil hacker attempts, and not so complex that users will have difficulty remembering their passwords and end up writing them on sticky notes pasted to the bottom of their keyboards.

Use software restriction policies

Using a software restriction policy, you can prevent unwanted programs from running; this includes viruses and Trojan horses, or other software that is known to cause conflicts when installed. Software restriction policies can also be used on a standalone computer by configuring the local security policy, or can integrate with Group Policy and Active Directory. (Click **Start** > **Run** > type **GPEDIT.MSC** > Go to **Computer Configuration** > **Windows Settings** > **Security Settings** > **Software Restriction Policies**)

Note: This feature is not available on Windows XP Home Edition

Limit the number of unnecessary accounts

Eliminate any duplicate user accounts, test accounts, shared accounts, general department accounts, etc., Use group policies to assign permissions as needed, and audit your accounts regularly. These generic accounts are famous for having weak passwords (and lots of access) and are at the top of every hacker's list of accounts to crack first. This can be a big problem at larger companies with understaffed IT departments. An audit at a Fortune 10 company I worked for revealed that 3,000 of their 15,000 active user accounts were assigned to employees who no longer worked for the company. To make matters worse, we were able to crack the passwords on more than half of those inactive accounts.

Rename the Administrator Account

Many hackers will argue that this won't stop them, because they will use the SID to find the name of the account and hack that. Our view is, why make it easy for them. Renaming the Administrator account will stop some amateur hackers cold, and will annoy the more determined ones. Remember that hackers won't know what the inherit or group permissions are for an account, so they'll try to hack any local account they find and then try to hack other accounts as they go to improve their access. If you rename the account, try not to use the word 'Admin" in its name. Pick something that won't sound like it has rights to anything.

Consider creating a dummy Administrator account

Another strategy is to create a local account named "Administrator", then giving that account no privileges and impossible to guess +10 digit complex password. This should keep the script kiddies busy for a while. If you create a dummy Administrative account, enabled auditing so you'll know when it is being tampered with.

Replace the "Everyone" Group with "Authenticated Users" on file shares

"Everyone" in the context of Windows XP security, means anyone who gains access to your network can access the data. Never assign the "Everyone" Group to have access to a file share on your network, use "Authenticated Users" instead. This is especially important for printers, who have the "Everyone" Group assigned by default.

Prevent the last logged-in user name from being displayed

When you press Ctrl-Alt-Del, a login dialog box appears which displays the name of the last user who logged in to the computer, and makes it easier to discover a user name that can later be used in a password-guessing attack. This can be disabled via the Group Policy snap in. (Click **Start** > **Run** > type **GPEDIT.MSC** > Go to **Computer Configuration** > **Windows Settings** > **Security Settings** > **Local Policy** > **Security Options**)

Make sure that Remote Desktop is disabled

Remote Desktop is a new feature in Windows XP Professional that allows you to connect to your computer remotely and work as though you are sitting at the console. While this may be convenient for some users, it also makes it easier for a hacker who has compromised one of your user accounts to log in directly to your machine from a remote location. Fortunately, remote desktop is not enabled by default on Windows XP Professional, and is not available for Windows XP Home Edition. For more information see KB Article Q306300

You can make sure it stays off your PC's on your network by using Group Policy.

To use the computer's local group policy to disable Remote Desktop:

1. Click **Start** > **Run**, type **gpedit.msc**, and then click **OK**.
2. In the Group Policy editor, click to expand **Computer Configuration**, click to expand **Administrative Templates**, click to expand **Windows Components**, and then click to expand **Terminal Services**.
3. Double-click the **Do not allow new client connections policy.**
4. **Set the policy to Enabled, and then click OK.**

You can also use the following procedure to disable Remote Desktop; however, if you use the preceding procedure, the following configuration is overridden:

1. **Right-click My Computer and click Properties.**
2. **Click the Remote tab.**
3. **In the Remote Desktop section, click to clear Allow users to connect remotely to this computer, and then click OK.**

NOTE: Remote Desktop is not available in Windows XP Home Edition

Disable unnecessary services

An unnecessary service is an unnecessary hacker hole, as well as a drain on system resources. You can disable services via **Control Panel > Administrative Tools > Services**

You may wish to consider disabling the following services:

- **Disable IIS** - Luckily, IIS in not installed by default in Windows XP. If you enabled it during your installation, and aren't using it you should disable it. If you are using IIS on your workstation, you need to take extra precautions to lock it down and stay on top of security vulnerabilities specific to web services.
- **NetMeeting Remote Desktop Sharing**
- **Remote Desktop Help Session Manager -** If you haven't disabled this via Group Policy already

- **Remote Registry**
- **Routing & Remote Access** - if you're not dialing into your machine.
- **SSDP Discovery Service** - this disables the Universal PNP Service, which leaves TCP Port 5000 wide open.
- **Universal Plug and Play Device Host -** This is designed to allow your computer to automatically connect to network-enabled appliances. Although there are no practical uses for this technology yet, several severe security flaws have already been discovered. Use the UnPlug and Pray utility from Gibson Research to disable "Universal Plug and Play". Gibson's web site has additional information about why this is necessary
- **Telnet**

Enable EFS (Encrypting File System)

Windows XP Professional ships with a powerful encryption system that adds an extra layer of security for drives, folders, or files. This will help prevent a hacker from accessing your files by physically mounting the hard drive on another PC and taking ownership of files. Be sure to enable encryption on Folders, not just files. All files that are placed in that folder will be encrypted. For more information check out our EFS Resource Center
Note: This feature is not available on Windows XP Home Edition

If you use Offline Folders, encrypt the local cache

With Windows XP, you can mark any shared folder that is available on the network (or any Web page) to be made available offline. The contents of these shared folders (or pages) are copied to an Offline Files database that is known as the client-side cache, where you can access them when not connected to the network. To safeguard offline files against theft, you can specify that the client-side cache is encrypted. To encrypt the Offline Files database on a local computer: Click **Start** > **Folder Options** > select the **Offline Files** tab > If Offline Files are not already enabled, click the **Enable Offline Files** option > Click the **Encrypt offline files to secure data** option > Click **OK**.

Note: When encryption of offline files is enabled or disabled, the entire database is affected; you cannot encrypt only some offline files. Also, if you are using the Fast User Switching feature in Windows XP, you will not be able to use offline files, and none of the options on the ***Offline Files*** *tab will be available. To disable Fast User Switching, use the User Accounts utility in Control Panel.*

Encrypt the Temp Folder

Applications such as Microsoft Office use the temp folder to store copies of files while they are being updated or modified, but they don't always clean the folder when you close the program. Encrypting the temp folder provides an extra layer of security for your files. Note: This feature is not available on Windows XP Home Edition

Clear the page file at shutdown

The Windows XP Page file can occasionally contain passwords and other sensitive data that your system has stored into memory. You can force the operating system to clear the page file by using the Local Computer Policy via the MMC, or via Group Policy

Advanced Security Measures

Enable Auditing on your Workstations

While this is a fairly normal practice for servers, it isn't usually performed on workstations unless there is a high risk of data theft. Our philosophy is that the time to fix the roof is before it starts to rain. By selectively auditing a few key actions, you'll have a place to start investigating theft or destruction of data if someone ever does compromise your workstation. We recommend auditing the following actions:

Event	Levels of Auditing
Account logon events	Success, failure
Account management	Success, failure
Logon events	Success, failure
Object access	Success
Policy change	Success, failure
Privilege use	Success, failure
System events	Success, failure

For more information see KB article Q310399

Disable default shares

Windows XP automatically creates a number of hidden administrative shares that the operating system uses to manage the computer environment on the network. These default shares can be disabled via the Computer Management console in the Control Panel, but they are re-enabled by the system after you restart your computer. The default hidden shares are:

Path	Fuction
C$ D$ E$	Root of each partition. For a Windows XP Professional computer, only members of the Administrators or Backup Operators group can connect to these shared folders.
Admin$	%SYSTEMROOT% This share is used by the system during remote administration of a computer. The path of this resource is always the path to the Windows XP system root (the directory in which Windows XP is installed: for example, C:\Winnt).
Fax$	This used by fax clients in the process of sending a fax. The shared folder temporarily caches files and accesses cover pages stored on the server.
IPC$	Temporary connections between servers using named pipes essential for communication between programs. It is used during remote administration of a computer and when viewing a computer's shared resources
Policy change	This is used by the Netlogon service to process log on requests
PRINT$	%SYSTEMROOT%\SYSTEM32\SPOOL\DRIVERS Used during remote administration of printers.

To prevent these shares from being created at startup, open RegEdit and edit the following key:
HKeyLocal Machine\SYSTEM\CurrentControlSet\Services\LanManServer\Parameters
Create a DWORD value called AutoShareWks and set the parameter to 0. (Note: This does not disable the IPC$ share in our tests, we're still working on a solution). You should test the functionality of your programs and services after you disable the default administrative shares. Some Windows services depend on the existence of these shares. In addition, some third-party programs may require that some of the administrative shares exist. For example, some backup programs may require these shares. You may be able to restore functionality by manually creating the required shares.

Disable Dump File Creation

A dump file can be a useful troubleshooting tool when either the system or application crashes and causes the infamous "Blue Screen of Death". However, they also can provide a hacker with potentially sensitive information such as application passwords. You can disable the dump file by going to the **Control Panel > System > Advanced > Startup and Recovery** and change the options for 'Write Debugging Information" to None. If you need to troubleshoot unexplained crashes at a later date, you can re-enable this option until the issue is resolved but be sure to disable it again later and delete any stored dump files

Disable the ability to boot from a floppy or CD ROM on physically unsecured systems.

There are a number of 3rd party utilities that pose a security risk if used via a boot disk (including resetting the local administrator password.) If your security needs are more extreme, consider removing the floppy and CD drives entirely. As an alternative, store the CPU in a locked external case that still provides adequate ventilation. You can also restrict access to the floppy and CD-ROM drives in Windows XP Professional via the Local Computer Policy in the MMC (Click **Start** > **Run** > type **GPEDIT.MSC** > Go to **Computer Configuration** > **Windows Settings** > **Security Settings** > **Local Policy** > **Security Options**)

Disable AutoRun for the CD-ROM

One of the easiest ways for a hacker with physical access to a company's PC's to distribute malicious code is via the CD-ROM. By creating a custom CD with a payload set to launch from the autorun feature in any machine, a hacker can affect any number of unlocked systems without ever leaving a fingerprint or touching a keyboard. Or he/she can simply leave a few of these lying around the office marked "MP3's", or "Payroll Data" and wait for an unsuspecting user to simply pick it up and insert it into their machine. You can disable this function in Windows XP Professional by clicking **Start** > **Run >** and type **GPEDIT.MSC** Then go to **Computer Configuration** > **Administrative Templates** > **System** > Locate the entry for **Turn autoplay off**

Consider using SmartCard or Biometric devices instead of passwords.

The more stringent your password policy is, the more likely your users will begin keeping paper password lists in their desk drawers, or taped to the bottom of their keyboard. Windows 2000 supports these devices, so consider the costs vs. risks of your most sensitive data. When using smart cards please make sure to apply configure your workstation to lock if you remove the smart card. Under **Local Policies** > **Security Options** > **Interactive logon** > **Smart card removal behavior** > **Lock Workstation setting**

Other Security and Authentication Issues

How to Automatically Log On a User Account in Windows XP
Microsoft Knowledge Base Article: 282866

How to Change the Logon Window and the Shutdown Preferences
Microsoft Knowledge Base Article: 291559

Setup configures Windows XP to use the friendly Welcome logon screen and the shutdown buttons, if your computer is installed as a home computer (a computer where a network domain has not been specified).

How to Set Logon User Rights by Using the NTRights Utility
Microsoft Knowledge Base Article: 315276

This article describes how to set logon user rights by using the NTRights utility.

Administrator Unable to Unlock a "Locked" Computer
Microsoft Knowledge Base Article: 242917

After you restart a computer running Windows and no one has logged on, you may be unable to log on to the computer either locally or to the domain.

A User Logon Request Is Rejected Without Any Messages
Microsoft Knowledge Base Article: 313322

If the security log is full and a restricted user with no password attempts to log on from the Windows XP Welcome screen, the logon request is rejected without any error messages.

TROUBLESHOOTING WINDOWS XP SHUTDOWN ISSUES

How to Perform an Emergency Shutdown in Windows
Microsoft Knowledge Base Article: 279134

Resources to Help Troubleshoot Shutdown Problems in Windows XP
Microsoft Knowledge Base Article: 308029

This article refers to resources that you can use to troubleshoot shutdown problems in Windows XP. After you follow the steps in each article in a section, determine if you have resolved the problem by either shutting down or restarting your computer. If you still cannot shut down or restart your computer, continue to the next section in order. Try to shut down or restart your computer at the end of each section.

Computer Does Not Shut Down Properly if Selective Suspend Is Enabled
Microsoft Knowledge Base Article: Q315664

After you attach a USB-based input device (such as a keyboard or mouse) to your computer, your computer may no longer shut down properly. For example, your computer may stop responding (hang) after you click **Turn off** or **Restart**

Computer Hangs During Shutdown **or**
Displays a "Cannot Find Enough Free Resources" Error Message
Microsoft Knowledge Base Article: 314101

"It is Now Safe to Turn Off Your Computer" Error Message When You Try to Shut Down Your Computer
Microsoft Knowledge Base Article: 810903

When you try to shut down your Windows XP-based or Windows 2000-based computer, the computer may stop responding ("hang"), and you may receive the following message:***"It is now safe to turn off your computer"***

Stop: Ox7E Error Occurs in Kbdclass.sys When You Try to Shut Down Windows XP
Microsoft Knowledge Base Article 313050

Windows XP Restarts When You Try to Shut Down Your Computer
Microsoft Knowledge Base Article: 311806

Windows XP Stops Responding (Hangs) During Windows Shutdown
Microsoft Knowledge Base Article: 307274

NOTES